Chapter 2

R645-301-200 Soils

TABLE OF CONTENTS

CHAPTER 2 SOILS

TABLE OF CONTENTS (Continued)

CHAPTER 2 SOILS

TABLE OF CONTENTS (Continued)

CHAPTER 2 SOILS

LIST OF APPENDICES

LIST OF TABLES

LIST OF FIGURES

TABLE OF CONTENTS (Continued)

CHAPTER 2 SOILS

LIST OF PLATES

R645-301-200 Soils

R645-301-220 Environmental Description

R645-301-221 Prime Farmland Investigation

The entire permit area is deemed unsuitable for prime farmland based on:

1. There is no available water rights of an agricultural nature in conjunction with and of the land within the permit area.

2. The vast majority of the permit area is excessively steep to farm.

3. The nature of the soils (excessive rock) prohibits farming activities.
Based on all of the above the only conclusion possible is there are no Prime Farmlands within the permit area. See Appendix 2-A, SCS Correspondence.

R645-301-222 Soil Survey

Five soil surveys which have been conducted on and adjacent to the permit area. The San Rafael Soil Conservation District and the Soil Conservation Service performed a soil and vegetation survey on the proposed mine property in Huntington Canyon in 1980. Soil descriptions from this survey can be found in Appendix 2-E. This survey did not characterize topsoil volumes. A second Order I soil survey was conducted in Nov 1990 by the U.S.D.A. Soil Conservation Service, at the request of the Division. The soil descriptions from this survey are also contained in Appendix 2-E. This survey was conducted subsequent to the mine disturbance.

In 1992, following this survey, in-place material at the mine site was evaluated for use as substitute topsoil material. The report of this evaluation is shown in Appendix 2-D. In 1996, soil samples were collected by Co-Op to evaluate the soils within the proposed Wild Horse Ridge disturbance. In 1998, the NRCS (formerly SCS) conducted an Order II survey of the proposed Wild Horse Ridge disturbance. No report was submitted to Co-Op by the NRCS of the results of the survey, but soil descriptions were given for the soils found. These descriptions have been included in R645-301-222.300. In 1999, an Order I soil survey was conducted by EIS for the Wild Horse Ridge area. This survey evaluated the 1996 soil samples and 1998 survey, and included additional sampling and an evaluation of the topsoil resources. The results of the 1999 survey are included in Appendix 2-F. The following sections and Plates 2-1 are based on the surveys conducted in 1990 and 1999.

The order I surveys cover approximately 32 acres in Bear Canyon in Huntington Canyon, Emery County, Section 23, 24, 25, and 26, T16S, R7E, SLBM. The soils are shown on Plates 2-1. Each soil is identified with a two or three letter symbol, and the pattern and extent are shown by the soil boundary lines on the map. Approximately 480 acres are mapped using the information from these surveys.

There are minor inclusions of other soils not identified. Also, the disturbed area and areas with man made fill, which have buildings or other man-made features on them, or areas covered with coal, could not be described as soil since they are highly variable in nature. These areas are generally made up of material from the general area or coal from the mine. The Topsoil pile is made up of topsoil and some subsoil which contains a high percent of rock.

222.100 Soil Maps

Plates 2-1 delineate different soil types.

222.200 Soil Identification

Table 2-1 Soil Maps Units

Soil Symbol	Soil Mapping Unit Name	Slopes
DZE	Datino-Sheepcan-Winetti Bouldary Loams	5 to 20 Pct slopes
PDR	Podo-Datino-Rock Outcrop Complex	40 to 70 Pct slopes
TR	Travessilla-Rock Outcrop-Strych Complex	50 to 70 Pct slopes
PC	Pathead-Cabba Complex	30 to 70 Pct slopes
WIN	Winetti, High Elevation	5 to 30 Pct slopes
WR	Winetti, High elevation-Rock Outcrop	10 to 30 Pct slopes
DON	Doney, Deep	10 to 30 Pct slopes
DG	Datino-Guben Complex	30 to 80 Pct slopes
GP	Guben-Pathead Complex	30 to 80 Pct slopes
DCP	Doney-Cabba-Podo Complex	30 to 80 Pct slopes

222.300 Soil description

A description of each soil-mapping unit is contained in the reports in Appendix 2-E and 2-F. Table 2-2 lists the Acreage of each soil unit found in the disturbed area. Following is a summary of each map unit.

Table 2-2 Soil Unit Acreages Within the Disturbed Area

Soil Symbol	Total Disturbed Acreage	Acreage with Topsoil Recovered	Est. Topsoil Depth (inches)
Disturbed	23.70	2.56[1]	In-place material[2]
DZE	1.83	1.83[3]	6
PDR	1.91	1.91	0-6
TR	1.66	1.66	0-3
PC	0.53	0.41	12
WIN	2.45	0.52	15
WR	0.72	0.50	10
DON	0.45	0.43	40
DG	3.96	2.22	6-30
GP	1.55	0.23	6-10
DCP	0.75	0.29	6-15

1 Main Topsoil Pile, 1,480 cu yds recovered from Scalehouse Pad area.
2 See Appendix 2-D.
3 Shower House Topsoil material, 1,200 cu yds recovered.

DZE - <u>Datino-Sheepcan -Winetti bouldery loams.</u>

These soils are very deep and well drained. They occur in alluvial valleys and on some moderately sloping toe slopes at elevations of 7,000 to 7,340 ft. These soils formed in alluvium and colluvium derived mainly from sandstone, limestone and shale.

Slopes are 5 to 20 pct, and are made up of the following:

Datino bouldery loam	55%
Sheepcan bouldery loam	20%
Winetti bouldery loam	15%
Other Soils	10%

Included in the other soils and land areas are the Strych soil, rubbleland, some areas of bedrock, and areas of man made fill ro disturbed areas.

Vegetation is dominantly pinion, Utah juniper, salina wildrye, squirreltail, big sagebrush, Douglas-fir, and Rocky Mountain juniper.

PDR - Podo - Datino - Rock outcrop complex.

This map unit is on very steep canyon side slopes. Slopes are 40 to 70, with an elevation of 7,000 to 8,000 ft.

Podo very stony fine sandy loam	35%
Datino very stony fine sandy loam	35%
Rock outcrop	20%
Other Soils	10%

Included in-other soils are Strych, Travessillia and Sheepcan soils.

Vegetation is dominantly pinion pine, Utah juniper, bitter brush curleaf mountain mahogany, Douglas fir, salina wildrye, Indian ricegrass and Rocky Mountain juniper.

TR - Travessilla - Rock outcrop - Strych complex.

These soils are very shallow to deep and are on steep canyon sides, elevation of 7,000 to 8,000 ft. They are generally on southeast to southwest facing aspects. Slopes are 50 to 70 pct and are made up of the following:

Travesilla	35%
Rock outcrop	30%
Strych	15%
Rubble	10%
Other Soils	10%

Included in the other soils are Podo, Datino, Sheepcan and a soil similar to Travesilla with loam or clay loam textures over weathered shale.

Vegetation is dominantly pinion pine, Utah juniper, curlleaf mountain mahogany, salina wildrye, Indian ricegrass, service berry and a few Douglas fir.

PC - Pathead-Cabba Complex

These soils are well drained and range from shallow to deep. It occurs on convex foot slopes in stony colluvium and shale. Slopes are 30 to 70 pct. Vegetation is mainly Pinyon and Juniper.

WIN - Winetti, High Elevation

These soils are shallow and well drained, occurring on a high gradient, ephemeral drainage system which lacks a well-defined bottomland. Slopes are 5 to 30 pct. Vegetation includes Douglas-fir, Cottonwood, Ponderosa Pine, Dogwood, and Wild Rose.

WR - Winetti, High Elevation-Rock Outcrop

The Soils occur at the upper end of the drainage bottom in the right Fork of Bear Canyon, and consists of a narrow canyon bottom with steep side slopes. Rock outcrop is common, as well as large boulders and stones. Slopes are 10 to 30 pct and the Unit is similar to the Winetti, high elevation, but is on a narrower and rockier section along the drainage. This unit contains only thin layers of topsoil.

DON - Doney, Deep

This map unit occurs in the Wild Horse Ridge topsoil stockpile area, near the drainage bottom. It is formed from local slope wash culluvium. Soils are well-drained with moderate permeability slopes are 10 to 30 pct. Vegetation is dominantly Ponderosa Pine, Salina Wildrye and Indian Wildrye.

DG - Datino-Guben Complex

These soils are well drained occurring on a steep slope, northfasing canyon slopes are 30 to 80 pct.

Vegetation includes Utah Serviceberry, Curleaf mountain mahogany, Pinion, Juniper, and Douglas-fir.

GP - Guben-Pathead Complex

This map unit is on a steep, north-facing side slope along the Wild Horse Ridge access road. Their soils are shallow with more sandstone bedrock present. Slopes are 30 to 80 pct. Vegetation includes Douglas-fir, Pinion Pine, Bristlecone Pine, Curleaf Mountain Mahogany, and Serviceberry.

DCP - Donev-Cabba-Podo Complex

This map unit occurs on the steep, rocky, south-facing slope of the Wild Horse Ridge Blind Canyon Seam Portal site. This soil is shallow and well drained, overlapping sandstone and shale. Slopes are 30 to 80 pct. Vegetation types are typically Pinion- Juniper type.

222.400 Soil Productivity

The present and potential productivity of existing soils can be found in Appendices 2-E, and 3-B.

R645-301-223 Soil Characterization

Typical soil properties determined by the SCS are discussed in R645-301-222.300 and found in Appendix 2-E and 2-F. Results of soil testing, conducted by the operator or consultants on soils within the permit area, are found in Appendix 2-A, 2-D and 2-F. Test results from the ballpark topsoil pile material, purchased to relieve topsoil deficiencies are also included in Appendix 2-A.

The 1984 Co-Op field investigations provided information on the physical and chemical properties of soils in the permit area and is discussed in Appendix 2-A. A rating for topsoil is included on the forms, as are some chemical properties. A discussion of soils in the Wild Horse Ridge Area is included in Appendix 2-F. Soils found on-site are listed in the Soils Legend and shown on Plates 2-1. In studies during the 1984 field season on site sampling was analyzed for the required chemical properties in all horizons (see Appendix 2-A).

R645-301-224 Substitute Topsoil

Due to the large amount of pre-disturbed area and limited nature of the active disturbance within the reclamation areas, in-place materials will be used for final reclamation plant growth medium. Use of such materials has proven successful in other mines within the surrounding mining community, such as Trail Canyon. Use of this material will eliminate the need to disturb additional areas for use as plant growth material borrows.

In the summer of 1991, Co-Op conducted an extensive testing program of the on-site materials. Test results showed that in-place spoils are suitable for the plant growth material to be used for reclamation. Test pits were located with the help of Henry Sauer of the Division, to be representative of each reclamation area. Patrick Collins, Ph.D., Biologist/Reclamation Specialist of Mt Nebo Scientific was contracted to analyze the test data. A copy of the report by Mt. Nebo Scientific can be found in Appendix 2-D. The soils laboratory results from Inter-Mountain Laboratories are included in the same appendix.

Samples were taken at intervals that were representative of the layering in the soil. Samples were tested according to the parameters listed in Table 2-4. Testing from various undisturbed sites was taken for use as a comparison with the on-site material. Testing will be conducted again on the areas to determine impacts continued mining has had on suitability in the final five-year permitted period before reclamation. See R645-301-243.

The on-site material also includes the downcast material from the cut roads. Procedures have been followed that verify the suitability of this material and are discussed further in Appendix 2-B and 2-C. With proper treatment to reduce compaction and improve proper nutrients and amendments the actual road material would prove suitable, similar again to procedures in use and used at other reclamation sites that had disturbances of a pre-law (pre-1977) nature.

Although material on the out slope of the coal storage pad is adequate as substitute topsoil, much of the slopes have been covered with coal. To improve the quality of this material, interim reclamation steps have and will continue to be taken. The out slope will be cleaned of coal as needed. Berms will be used to prevent future spills onto the out slopes. All existing eroded areas will be repaired using the material beneath the coal waste storage area (sample site# CSP-5) and storage pad out slopes, and the out slopes have been revegetated according to the approved interim revegation plan in R645-301-331.

Table 2-3 summarizes the location and amount of substitute topsoil material available. The minimum cut depth column shows the depth each area will have to be cut in order to grade each of the TS areas at the depths shown in Table 2-8.

Table 2-3 Available Substitute Topsoil Material

Location	Drill Hole	Drill Depth (in)	Area (acres)	Volume Available (cu. yd)	Minimum Cut Depth (in)
TS-3	**SEDB-1**	**24**	**.09**	**296**	**13**
TS-3	**SEDB-2**	**48**	**.09**	**602**	**13**
TS-3	**SHP-1**	**60**	**1.34**	**10,797**	**13**
TS-3	**SHP-2**	**60**	**.81**	**6,533**	**13**
TS-3 Totals			**2.33**	**18,228**	
TS-4	**SEDA-1**	**24**	**.24**	**777**	**2.5**
TS-4	**SEDA-2**	**24**	**.20**	**641**	**2.5**
TS-4 Totals			**.44**	**1,418**	
TS-5	**SP-1**	**18**	**.69**	**1,680**	**18**
TS-5	**SP-2**	**24**	**.36**	**1,150**	**24**
TS-5	**CSP-1**	**96**	**.95**	**12,292**	**30**
TS-5	**CSP-2**	**84**	**1.32**	**14,903**	**27**
TS-5	**CSP-3**	**72**	**.25**	**2,459**	**27**
TS-5	**CSP-4**	**60**	**1.67**	**13,477**	**27**
TS-5	**CSP-5**	**72**	**3.03**	**29,325**	**27**
TS-5 Totals			**8.28**	**75,286**	
TS-6	**PAR-1**	**84**	**2.62**	**29,589**	**12**
TS-7	**LHP-1**	**96**	**1.73**	**22,329**	**12**
TS-8	**USP-1**	**120**	**.87**	**14,036**	**12**
TS-9	**REF-1**	**36**	**.26**	**1,253**	**18**
TS-9	**REF-2**	**36**	**.71**	**3,413**	**18**
TS-9	**REF-3**	**36**	**.23**	**1,122**	**18**
TS-9 Totals			**1.20**	**5,788**	

R645-301-230 Operation Plan.

R645-301-231 General Requirements

231.100 Topsoil Removing and Storing

Topsoil Removal

Much of the Bear Canyon Mine area was disturbed prior to SMCRA, as well as prior to mining of the Bear Canyon Mine. As a result, topsoil was not recovered from much of the existing disturbed area (see Table 2-2). As a result, the Ballpark Topsoil Pile was imported to use for topsoil. Investigations of in-place material which could be used as plant growth material were conducted in 1992 (Appendix 2-D), and it was determined that the in-place material within the areas where topsoil was no recovered could adequately be used as substitute topsoil material.

The depth of topsoil removed previous to 1990 (recovered in association with construction of the scale house) was determined by the amount of A and B horizon material as defined in OSM Regulation 30 CFR 783.22. Existing vegetation was removed and topsoil was collected prior to excavation or other disturbance operations within the affected areas. The topsoil removed in these areas consists of A horizon quality material and B horizon quality material with virtually no distinctive color difference. The C horizon material was not removed since it had a significant pct of rock.

Topsoil recovered after 1990 consists of the topsoil from the Shower House pad, the Tank Seam Access Road and pad, and the Wild Horse Ridge disturbed areas. The depth of topsoil recovered from these areas is discussed in R645-301-231.400.

Prior to the start of all new construction, topsoil will be analyzed for parameters as outlined in Table 2-4, to determine the extent and depth of suitable plant growth medium and will be separately salvaged and stockpiled. All sampling, testing and interpretation will be conducted by a qualified soil scientist. The Division may review the soil scientist's qualifications prior to sampling and testing of the topsoil material. Topsoil is stockpiled, consolidated and protected from wind and water erosion and contamination, which might lessen its capability to support vegetation.

The equipment used for topsoil removal consists of bulldozers, track hoes, front-end loaders, and dump trucks. The use of bulldozers requires pushing of the topsoil to a collection point for loading into dump trucks or other means of transportation to the designated stockpile. During topsoil salvage operations supervisory personnel approved by the Division will be present at the time of the topsoil removal to instruct the equipment operators in the proper techniques of topsoil removal and to ensure that required horizons are removed and stored. The individual will document topsoil salvage operations, including salvage history, soil salvage areas and volumes, and soil placement in the stockpile. Topsoil will be salvages from all areas accessible by equipment, including bouldery and steep slopes as required under R645-301-232.

TABLE 2-4a Analytical Methods For Baseline Soil Characterization

Test to be Performed	Reported As	Suggested Methods[1]
pH	saturated paste standard units	Soil Science Society of America. 1996. Series No. 5. Methods of Soil Analysis: **Part 3** - Chemical Methods. Chapter 14, page 420 and Chapter 16, page 487.
Saturation %	%	Ibid. Chapter 14, pp 420 - 422.
EC_e	dS/m @ 25°C (or mmhos/cm)	Ibid. Chapter 14, pp 420 - 422 and pp 427 - 431.
Soluble Na, K, Mg, Ca	meq/L	Ibid. Chapters 14 pp 420-422 (saturation extract);Chapter 19 pp 555-557; Chapter 20 pp586-590 (spectroscopic methods).
Alkalinity of the saturation extract	HCO_3^- as mg/L $CaCO_3$	Western States Laboratory Proficiency Testing Program Soil and Plant Analytical Methods.[2] 1998. v 4.10. p 19. (Saturation Paste Extract Alkalinity, titration with 0.02N HCl)
Available NO_3-N	mg/Kg	Soil Science Society of America. 1996. Series No. 5. Methods of Soil Analysis: **Part 3** - Chemical Methods. Chapter 38. p 1129 (KCl extraction). For analysis follow: Sims, J.R. and G.D. Jackson. 1971. Rapid Analysis of Soil Nitrate with Chromotropic Acid. Soil Sci. Soc. Am. Proc. 35-603-606.
Available Phosphorus	mg/Kg	Soil Science Society of America. 1996. Series No. 5. Methods of Soil Analysis: **Part 3** - Chemical Methods. Chapter 32, page 895. ($NaHCO_3$ Extraction.)
Particle Size Analysis	% very fine sand, sand, silt, clay	Soil Science Society of America. 1986. Series No. 5. Methods of Soil Analysis: **Part 1** - Physical and Mineralogical Methods. Chapter 15 pp 398 and 404-409 (Hydrometer Method).
Organic Matter	%	Western States Laboratory Proficiency Testing Program Soil and Plant Analytical Methods. 1998. v 4.10. p 86. (Loss on Ignition, convert %LOI to OM by regression intercept value as noted in method)
$CaCO_3$ %	%	Ibid. p. 99 (Soil Carbonates, Gravimetric Determination after extraction with 3 M HCl.) Total Inorganic Carbon = %$CaCO_3$ x 0.12.

[1] Laboratories vary in their capabilities. Specify these recommended methods to the laboratory. Use of other methods requires prior approval from the Division.

[2] From: Plant, Soil and Water Reference Methods for the Western Region. 1994. R.G. Gavlak, D.A. Horneck, and R.O. Miller. WREP 125.

TABLE 2-4b

Additional Analyses Required for Substitute Topsoil, Overburden, Spoil, and Coal Mine Waste.

PARAMETERS	Reported As	RECOMMENDED METHOD
Total Organic Carbon	%	Western States Laboratory Proficiency Testing Program Soil and Plant Analytical Methods. 1998. v 4.10. p 88. (Combustion Method)
Soluble Selenium	mg/kg	Soil Science Society of America. Methods of Soil Analysis: Part 3 - Chemical Methods. Series No. 5, 1996.Chapter 30. pp 805 - 811. (Hydride Generation Atomic Absorption-Spectrometry and Fluorimetry of water extractable selenium)
Available Boron	mg/kg	Soil Science Society of America. Methods of Soil Analysis: Part 3 - Chemical Methods. Series No. 5, 1996.Chapter 21. p 611 (saturation extract).
Acid Potential	% S	U.S. EPA, 1978, EPA 600/278-054. Method 3.2.6, pg 60
Neutralization Potential	% $CaCO_3$	U.S. EPA, 1978, EPA 600/278-054. Method 3.2.3, pg 47

Topsoil Storage

Plans involving topsoil storage can be labeled as "short term" or "long term" depending on completion of activities in each area and the reclamation schedule presented. All material will be stored as required under R645-301-234.

Short-Term Topsoil Storage Areas.

Short-term stockpiles of topsoil will be for areas to be reclaimed almost immediately upon cutting. At final grade topsoil will be redistributed promptly to minimize natural degradation processes. No short-term piles are anticipated at this time. If a need arises, a site-specific plan will be submitted prior to disturbance.

Long-Term Topsoil Storage Areas.

During any new construction of areas that will be used for the duration of the mining operation within the permit area, topsoil will be collected and stockpiled. The topsoil will be used for post-mining reclamation.

During construction of topsoil stockpiles, compaction of the topsoil material will be minimized by limiting the extent of the area where equipment traffic drives on the material. Where this compaction is unavoidable, the compacted material will be ripped and loosened prior to being covered or seeded in order to leave it in a non-compacted state.

The following table summarizes the volumes of topsoil being stored.

Table 2-5 Topsoil Summary Table

Description	cu yd
Main Topsoil Pile	1,480
Tank Seam Road Topsoil Storage Areas	1,000
Wild Horse Ridge Topsoil Pile	12,254
Wild Horse Ridge Tank Seam Topsoil Pile	1,400
Subtotal	16,134
On-site Material (Substitute Topsoil)	36,452
Total	52,586

Suitability of Topsoil Substitutes or Supplements

Material designated to be used as substitute material have been sampled and their chemical and physical properties discussed in Appendix2-C.

231.300 Soil Testing Plan

This is outlined in R645-301-243

231.400 Construction, Modification and Maintenance

There are four existing storage areas on site that are shown on Plates 5-2. All of these sites are discussed in the following sections.

Native material to be used as substitute plant growth medium is also available on-site under the pad areas, roads, borrow pits, embankments and as downcast material for the cut road areas. R645-301-224 discusses use of the "on-site" material. In order to show that the downcast material from the Portal Access Road is adequate and suitable as final reclamation plant growth material, procedures outlined in Appendix 2-C will be followed. With the successful use of in-place materials at Trail Canyon and other mines within the Emery County area, Co-Op is confident that all requirements will be met with minimal impact to the area.

When the large flat or pad areas were constructed, the upper most material (topsoil) was pushed to the bottom of the pile and covered with material taken from the created cut slopes and highwalls. Although this material is becoming compacted during operation the non-toxic and non-acid forming nature of the coal and other possible contaminants poses little potential impact to the suitability of this soil.

All areas used for plant growth material sites will be revegetated and the soil stabilized during the first fall following removal. Reclamation will follow the procedures defined in this plan. The following topsoil piles are located within areas of the permit boundary. These piles should be considered "long term".

Main Topsoil Storage Pile

The original topsoil storage pile is located northeast of the scale house in Bear Canyon. This pile consisted of topsoil material stripped from the Bear Canyon disturbance during construction of the scale house etc. The results of an as-built survey conducted in 1990, see Plate 2-2A, showed that the pile contained a reserve of approx 1,480 cu yds. The pile is marked and protected by a berm and vegetation to prevent soil loss.

Due to the suitability of "in-place" soils, material in the main topsoil pile will be used on specific locations determined during reclamation recontouring.

Ball Park Topsoil Storage Pile

3,400 cu yds of topsoil material was purchased for use and stored on the Bear Canyon Ball Park area located south-west of the scale house. This material was stripped from an area purchased by Co-Op from R. D. Campbell in Carbon County, along the Price River, and brought to Bear Canyon to make up the deficit in required topsoil. Subsequent testing has shown that onsite material is available for reclamation of the entire site, as discussed in R645-301-224. Therefore the ballpark topsoil pile will not be needed for reclamation.

The Ball Park topsoil storage area was added to the permit area 8 February 1985 and was incorporated into the plan based on the following on-site conditions:

1. The mine site was fully occupied with the existing structures.

2. There appeared to be no site within the permit boundary that could be utilized without massive additional disturbance.

3. Due to the critical winter range statute of the canyon bottom for Mule deer winter feed, any additional disturbance was deemed unwarranted.

4. The vegetation established at the additional site would enhance wildlife feed.

The Ball Park topsoil storage area is shown in Figures 2-1 and 2-2. Topsoil was placed in non-compacted lifts to a depth of 22 to 24 in. over an area of approx 1.28 acres (3,960 cu yds). The area is protected by a berm, and has been revegetated according to the seed mix in Table 2-6. This seed mix is designed for a rapid establishment of a turf suitable for recreation use as well as rapid establishment of a dense sod covering. A sprinkling system is installed on this area to ensure both establishment and permanence.

Since a demonstration has been made in R645-301-242 that this material is not needed, the material has been left in place on the ballpark for the post-mining land use.

Table 2-6 Ball Park Seed List

Species	Coverage
Poa pratensis	50#/acre
Festuca dasycloda	50#/acre

Figure 2-1 Photographs of Ball Park Area

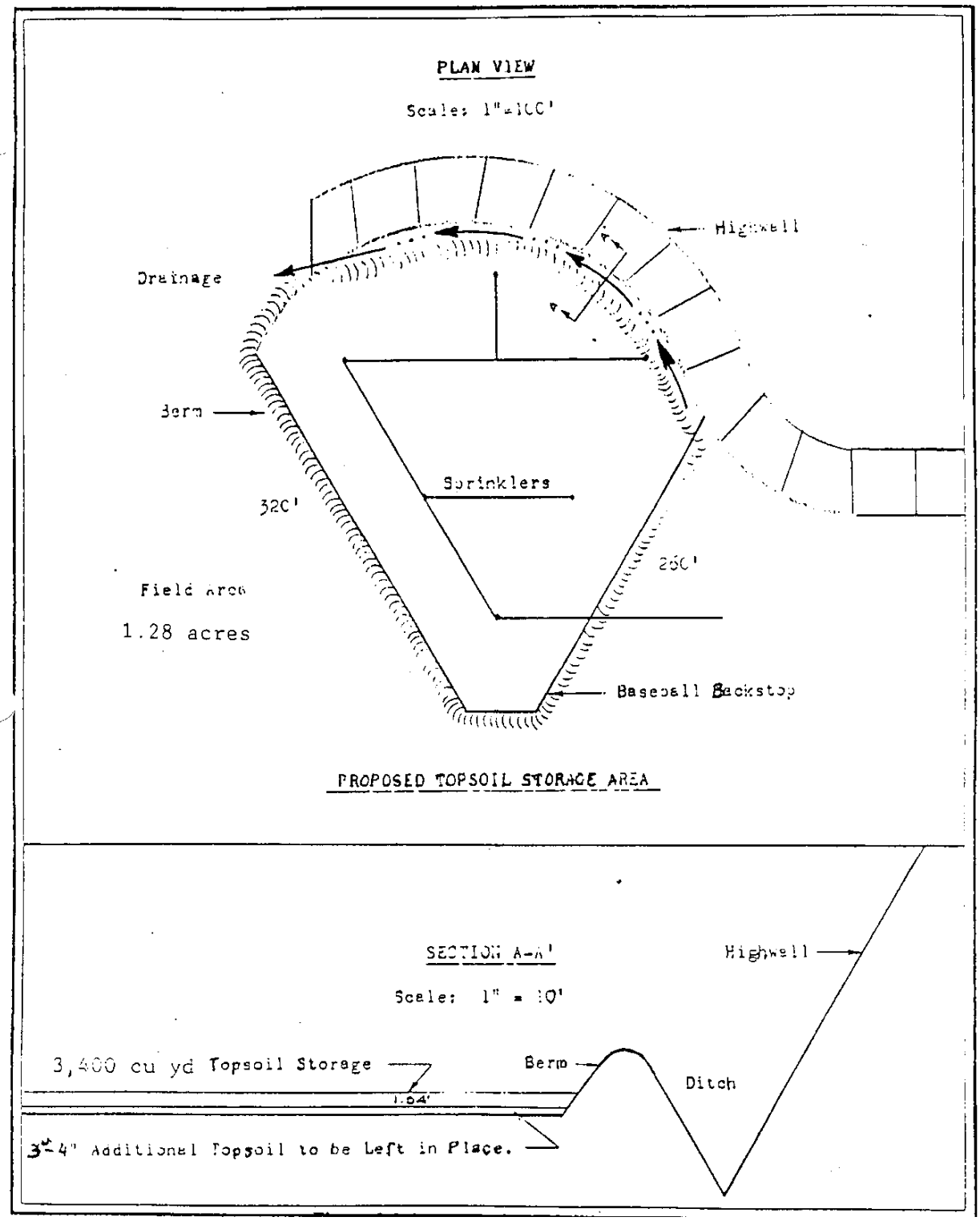

Figure 2-2 Ballpark Topsoil Storage Pile

Tank Seam Access Road and Portal Pad Topsoil Pile

A survey of topsoil material was performed in the area of the Tank Seam access road and portal pad area in 1992. Four sites were sampled and the soil was analyzed. These sites are designated on Plate 2-3E as TSA-1, TSA-2, TSA-3 and TSA-4 (See Appendix 2-A for test results). Results indicated highest organic matter accumulations in the top 0-6 inches. Test results also indicate that the material tested is suitable for final reclamation material at all depths. See discussion in Appendix 2-D. Soil depths were determined by the visible presence of organic matter and a distinct soil color change. The observations indicated a varying soil depth of 0 to 8 inches, the lesser depths being in the steep rocky areas. During construction, topsoil was stripped at depths varying from 0 to 8 inches by visually observing the depth at which organic material is found in the soil. The volume of topsoil which was recovered and placed in the designated storage area is 1,000 cubic yards.

Topsoil was recovered on the access road during construction and relocated to topsoil areas shown on Plate 5-2C and 5-2E. Plates 2-2 show the details of the topsoil stockpiles. Upon completion of the topsoil recovery and storage, the topsoil was revegetated. A berm is maintained around the piles to totally contain runoff from the piles. Typical dimensions of the berms are shown on Plates 2-2 and described in Appendix 7-K, BTCA area “P”.

Wild Horse Ridge Topsoil Stockpile

A survey of topsoil material was performed in the area of the shower house pad and Sediment Pond "C". Three sites were sampled and the soil was analyzed. These sites are

designated on Plate 2-3B as REF-1, REF-2 and REF-3 (See Appendix 2-A and 2-D for test results). Results indicated organic matter accumulations in the top 4 inches of REF-1 and REF-3 and the top 8 inches of REF-2. A field survey was conducted to verify the depths. Soil depths were determined by the visible presence of organic matter and a distinct soil color change. Field observations showed soil depths of 5 inches for REF-1, 8 inches for REF-2 and 7 inches for REF-3. Other sites were excavated and observed visually throughout the area. The observations indicated a varying soil depth of 6 to 8 inches, the lesser depths being in the vicinity of REF-1. Soil depths averaged 8 inches in the vicinity of REF-2 (0.47 acres), 7 inches in the vicinity of REF-3 (0.69 acres) and 6 inches in the vicinity of REF-1 (0.68 acres).

Prior to construction on the shower house pad, topsoil material was salvaged at these approximate depths and stockpiled. Topsoil salvage consisted of confirming and staking out depths throughout the area to facilitate excavation activities, removing vegetation and large rocks which could interfere with topsoil salvage operations. Shrubs and herbaceous vegetation were salvaged along with the topsoil material to enhance the quality of the salvaged material. The final topsoil stockpile consisted of 1200 cu yds of material for reclamation, due to the extreme amount of boulders and rocks on the surface which were too large in volume to place in the pile.

In 2001, Co-Op relocated this topsoil material to the Wild Horse Ridge topsoil stockpile.

An Order I soil survey of topsoil material was performed in the Wild Horse Ridge area. The results of this survey are included in Appendix 2-F and Appendix 2-G.

Topsoil salvage depths for each unit are shown on page 13 of Appendix 2-F, and page 7 of Appendix 2-G. Soil map units are shown on Plate 2-1. Co-Op proposes to salvage topsoil in

Topsoil salvage depths for each unit are shown on page 13 of Appendix 2-F, and page 7 of Appendix 2-G. Soil map units are shown on Plate 2-1. Co-Op proposes to salvage topsoil in accordance with Appendix 2-F. The actual depth may vary in areas where high organic material is present at deeper or shallower depths, or where bouldery material precludes accurate salvage of the specified depths.

Topsoil ~~will be~~ was recovered during construction and relocated to the stockpile area shown on Plates 5-2F and 5-2G. A total of 8,700 cubic yards of topsoil ~~will be~~ was recovered during construction of the Blind Canyon Seam Pad, as shown in Table 5J-1. Plate 2-2E shows the details of the topsoil stockpile. The topsoil stockpile will be surrounded with a containment berm and protected as stated in R645-301-234.220. An additional volume of 2,354 cubic yards of topsoil within the stockpile area will not be disturbed, but is included in the total available volume in Table 2-8. Permeable fabric strips will be placed over this area prior to stockpiling additional topsoil in the area to preserve the location of the contact between the native topsoil and additional topsoil placed in the pile.

During construction of the Tank Seam Pad a total of 1,300 cubic yards of topsoil ~~will be~~ was recovered, as shown in Table 5K-1. Details of the topsoil stockpile are shown in Appendix 5-K

INTENTIONALLY LEFT BLANK

FOR MOHRLAND

R645-301-232 Topsoil and Subsoil Removal

232.100 Topsoil Removal Prior to Disturbance

Topsoil will be removed prior to disturbance, where possible, and stored for reclamation.

232.200 Insufficient Topsoil

Material to be utilized for final reclamation have all proven to be of a quality suitable for reclamation purposes.

232.300 Topsoil material less then 6" thick

More than six inches of material exists at all sites were topsoil was recovered and where substitute topsoil will be removed.

232.400 Area where topsoil will not be recovered

The Division will determine areas where topsoil will not be recovered.

232.500 Subsoil Segregation

The Division will determine the need for subsoil segregation.

232.600 Timing

Soil material will be removed after the vegetative cover is cleared away and prior to other surface disturbances.

R645-301-233 Topsoil Substitutes and Supplements

C.W. Mining Co. has conducted filed studies to demonstrate that all substitute topsoil material meets the requirements of R645-301-233. The results of these studies can be found in Appendix 2-C.

R645-301-234 Topsoil Storage

234.100 Stockpiling of Topsoil

Materials removed under R645-301-232.100, R645-301-232.200, and R645-301-232.300 will be stockpiled when it is impractical to redistribute such materials promptly on regraded areas.

234.210 Topsoil Placement

Material will be placed on a stable site within the permit area.

234.220 & 234.230 Topsoil Protection

The short-term topsoil stockpile will be sprayed with water or temporarily vegetated to retard erosion. The long-term topsoil stockpile will be protected by the following operational steps:

1. A stable surface will be provided in an area outside the influence of active operations.

2. As a stockpile is completed, it will be left in a rough condition to minimize erosion.

3. Stockpiles will be situated out of drainage to prevent water erosion. A berm will be constructed around the stockpiles.

4. Storage piles will be vegetated with quick growing, soil-stabilizing plants. Revegetation will involve the immediate seeding and mulching of stockpiles during the next planting season with the seed mixture recommended in R645-301-341, in compliance with the requirements of the appropriate land management agency.

5. Signs will be posted to protect the stockpiles from accidental use as fill or from other inadvertent material contamination. The establishment of noxious plant species will be prevented.

6. Stockpiled topsoil will not be removed or otherwise disturbed until required for redistribution on a prepared and regraded disturbed area.

234.240 Topsoil Movement

Topsoil material will not be moved until required for redistribution unless approved by the Division.

R645-301-240 Reclamation Plan

R645-301-241 General Requirements

During reclamation of the areas shown in Table 2-7, the areas will be regraded as described in Appendix 5-I. Areas containing substitute topsoil material will be regraded by stripping the substitute topsoil material and placing it over adjacent areas in which the regrading has been completed. The material will be recovered to the depth needed to obtain the volumes of material shown in Table 2-8.

Table 2-8 shows the estimated volume required. The depths shown are the minimum depths. Actual depths may be greater in some areas. In Table 2-8, the "Substitute Topsoil Generated from Cuts" shows the actual volumes of available material which are expected to be re-graded, showing that there is a sufficient amount of substitute topsoil material available to meet the proposed topsoil depths as shown in the table. These volumes are included in the total volume of regraded material shown in Appendix 5-I. A detailed description of the reclamation for each area is included in R645-301-242.

Table 2-7 Reclamation Area Summary					
MARK[1]	DESCRIPTION	Total ac.[1,2,3]	Re-contour acres[1&3]	Pre-1977 acres[2]	New acres
TS-1	Ball Park Topsoil Pile	1.27	0.0	-0-	1.27
TS-2	Lower Haul Road	1.6	0.0	1.6	-0-
TS-3	Sed Pond B & Scale Office Pad	2.60	1.41	1.23	1.37
TS-4	Sed Pond A	0.75	0.75	-0-	0.75
TS-5	Main Pad Area	12.32	9.41	8.89	3.43
TS-6	Portal Access Road	3.25	3.25	0.02	3.23
TS-7	Blind Canyon Seam Portal Area	1.81	1.81	0.51	1.30
TS-8	Upper Storage Pad	0.87	0.83	-0-	0.87
TS-9	Shower House Pad	1.83	1.83	-0-	1.83
TS-10	Tank Seam Access Road	2.91	2.91	-0-	2.91
TS-11	Tank Seam Portal Pad	0.66	0.59	-0-	0.66
TS-12	Wild Horse Ridge Access Road	3.26	0.22	-0-	3.26
TS-13	Conveyor belt Access/Topsoil	1.50	1.14	-0-	1.50
TS-14	Upper Conveyor belt Access Road	.96	0.66	-0-	0.96
TS-15	WHR Blind Canyon Seam Portal Area	1.58	1.58	-0-	1.58
TS-16	WHR TS Lower Portal Access Road	0.89	0.0	-0-	0.89
TS-17	WHR TS Upper Access Road and Pad	2.22	1.74	-0-	2.22
TOTAL		40.28	28.13	12.25	28.03

Notes:

1. See Plates 2-3.
2. See Plates 5-2.
3. The total acres represent acreage which will be reclaimed. Some of the acres will not require re-contouring or regrading during reclamation. The "Re-contour acres" represent the total acres which will require regrading. The "Total acres" shown will be reclaimed in accordance with the reclamation plan.

The proposed substitute topsoil material will be re-tested in the final five years of operations according to Table 5O-1 and will include Total Petroleum Hydrocarbons by EPA Methods 8015 and 418.1. The location of these samples will correlate with the areas generating the most substitute topsoil material as described in Appendix 5-I. Following regrading, soils remaining on the surface as substitute topsoil material will be sampled for pH, EC, and Total Hydrocarbons by EPA method 8015 for diesel fuel and 418.8 for waste oil.

Table 2-8 Substitute Topsoil Summary

	Topsoil Amounts Required			Substitute Topsoil Generated from Cuts (cu. yd.)			
Location	Area (acres)	Depth (in.)	**Volume (cu. yd.)**	Topsoil Stockpile	Sub. Topsoil Generated	Sub. Topsoil Not Regraded	Total Topsoil
TS-3	1.41	12	**2,275**	0	2,080	2,563	**4,643**
TS-4	.75	10	**1,008**	0	1,008	0	**1,008**
TS-5	9.41	12	**15,181**	0	21,492	4,537	**26,029**
TS-6	3.25	12	**5,243**	0	7,111	0	**7,111**
TS-7	1.81	12	**2,920**	0	4,170	0	**4,170**
TS-8	.83	12	**1,339**	0	3,552	0	**3,552**
TS-9	1.83	12	**2,952**	1,200	3,761	0	**4,961**
Total			**36,452**				**51,842**

R645-301-242 Soil Redistribution.

Following backfilling and regrading and prior to topsoil redistribution, regraded land will be scarified by a ripper to a depth of 14 in. in order to reduce surface compaction, provide a roughened surface assuring topsoil adherence if required, and promote root penetration. Steep slope areas which must remain after abandonment will receive special ripping to create ledges, crevices, pockets, and screens. All reclaimed areas will be gouged to roughen the surface. This will allow better soil retention and vegetation establishment.

Each of the reclamation areas is discussed below as labeled on Plates 2-3. Topsoil will be distributed on reclamation areas as required prior to seeding. Topsoil redistribution procedures will ensure an approx uniform thickness of 5 inches as indicated by Soil Survey - Nov 1990 (Appendix 2-E), or as outlined in sections below. Topsoil will be redistributed in the fall of the year (Sept-Oct) suitable for establishment of permanent vegetation. A very roughened seedbed will be left in all cases.

To minimize compaction of the topsoil following preparation and/or redistribution, travel on reclaimed areas will not be allowed. Co-Op will exercise care to guard against erosion during and after application of topsoil and will use mulch, tackifiers, and erosion control matting as defined in R645-301-341.

The soil stabilization methodology that will be used includes the placement of crushed and heavier material at the toe of road fill slopes, and the random placement of large rocks and boulders on the surface. This procedure will enhance the microclimate as well as make the

reclaimed area more aesthetically compatible with the undisturbed surroundings. The detailed revegetation plan to be submitted in the last five year permit renewal prior to reclamation, will include maps showing the areas to receive matting.

TS-1 Ball Park Topsoil Pile. Reclamation plant growth material will come from in-place material.

TS-2 Lower Haul Road. Disturbance to this section is limited to the road impacts from added road base material, compaction and minor spills of coal material that occur from haul vehicles. This area is within the pre-1977 disturbance area and did not have topsoil recovered for reclamation purposes. With ripping, regrading and seedbed preparation as described in this plan additional plant growth material will not be required.

TS-3 Sediment Pond B and Scale House. Approx one half of this area is within the pre-1977 disturbed area. The embankment material from sed pond B is vegetated showing its suitability as substitute plant growth material. The material over the culverted creek is seeded as a back yard for the scale house also indicating good suitability. With removal of the culvert this material will be available for distribution. The road material can be treated as in area TS-2. A total 18,228 cu. yd. of substitute topsoil material is available in the recovered area. 0.32 acres will not be regraded but will simply be ripped to a depth of 12 inches and used in place giving a volume of

2,563 cu. yd. non-regraded substitute topsoil material. 2,080 cu. yd. of the available substitute topsoil will be used in the remaining area giving a depth of at least 12 inches of substitute topsoil material over the entire area.

TS-4 Sediment Pond A. The embankment material from sed pond A is vegetated indicating good suitability as substitute plant growth material. 1,418 cu. yd. of substitute topsoil material is available in the recovered area. 1,008 cu. yd. of this material will be used giving a minimum depth of 10 inches.

TS-5 Main Pad Area. Covering approx 12.32 acres, this is the largest of the disturbed areas. Approx one third of this area is covered with coal storage. All but approx two acres of this area are within the pre-1977 disturbed area and did not have topsoil recovered for reclamation purposes. Although the coal storage and traffic within this area will compact the fill material, testing shows that it is suitable as plant growth material. Fill used for the upper layer of recontouring material will come from the outer or eastern edge of the pad. This material was the topsoil prior to Mining. 75,286 cu. yd. of substitute topsoil material was tested in the recovered area. 15,181 cu. yd. of this material will be used giving a minimum depth of 12 inches over the entire area. 15,428 cu. yd. of fill material will be generated in this area for use in TS-7 and TS-8.

TS-6 Portal Access Road. This area was disturbed prior to initiation of Mining by Co-Op Mining Co. and did not have topsoil recovered for reclamation purposes. This area has received special attention in the past and is discussed in Appendix 2-C. This area will be treated the same as area TS-2. 29,589 cu. yd. of substitute topsoil material is available in the recovered area. 7,111 cu. yd. of material will be used giving a minimum depth of 12 inches of substitute topsoil material over the entire area. 2,553 cu. yd. of fill material will be generated in this area for use in TS-7 and TS-8.

TS-7 Portal Pad Area. Most of this area is within the pre-1977 disturbed area and did not have topsoil recovered for reclamation purposes. Downcast material will be recovered for reclamation. 22,329 cu. yd. of substitute topsoil material is available in the recovered area. 4,170 cu. yd. of this material will be used giving a minimum depth of 12 inches of substitute topsoil material over the entire area. 11,582 cu. yd. of fill material will come from TS-5 and TS-6.

TS-8 Upper Storage Pad. This area did not have topsoil recovered for reclamation purposes. Non-toxic and non-acid forming materials are stored on the pad. Sources for contamination are minimal. This area will be treated the same as TS-7. Some material from the lower pad areas will be required to recover the highwalls. See Appendix 5-I. 14,036 cu. yd. of substitute topsoil material is available in the recovered area. 3,552 cu. yd. of this material will be used giving a

minimum depth of 12 inches of substitute topsoil material over the entire area. 1,952 cu. yd. of fill material will come from TS-5 and TS-6.

TS-9 Shower House Pad. This area will have topsoil recovered for reclamation purposes. Sources for contamination are minimal. Following recontouring at the time of final reclamation, the topsoil material recovered prior to construction will be spread over the surface to attain an approx depth of 7 inches. Additional in place material has been tested and is available in the recovered area for substitute topsoil. At least 2,952 cu. yd. of this material will be placed below the 7 inches of topsoil, giving a minimum depth of 12 inches of topsoil or substitute topsoil material over the entire area.

TS-10 Tank Seam Access Road. Topsoil material recovered during construction will be placed in the topsoil storage piles located along the Tank Seam access road and is shown on Plate 2-2E. Additional plant growth material will not be required.

TS-11 Tank Seam Portal Pad. Topsoil material recovered during construction will be placed in the topsoil storage pile shown on Plate 2-3E and 2-2E.

TS-12 Wild Horse Ridge Access Road This road existing prior to mining and will remain in place after mining activities. Some upgrading and widening of the road will be required for mining use, so topsoil will be recovered from isolated areas of new disturbance and placed in the topsoil storage pile shown on Plate 2-3F and 2-2B. These soils were identified as Winetti soils, and approximately 15" of topsoil will be salvaged from 0.22 acres. A total volume of 444 yd^3 of topsoil will be salvaged. These same areas will require topsoil redistribution during reclamation. The 15" depth recovered from these areas will be redistributed at the same depth. Additional plant growth material will not be required.

TS-13 Conveyor belt Access/Topsoil Stockpile: This area will have topsoil recovered for reclamation purposes. The depth of recovery will be as follows: 12"of topsoil from 0.41 acres of the Pathead-Cabba Complex; 15" of topsoil from 0.30 acres of Winetti soil; and 40" from 0.43 acres of Doney Complex. (See Appendix 2-F). A total volume of 3,579 yd^3 will be recovered from this area. This includes 2,354 yd^3 located within the topsoil storage area. Topsoil from this area and additional areas will be stored as shown on Plate 2-2B. Sources for contamination are minimal since this area is isolated form the majority of the mining activities. Following recontouring at the time of final reclamation, the topsoil material recovered prior to construction will be spread over the surface to obtain an approximate depth of 13 to 14 inches. Some topsoil from this area may be available for use in other areas of the mine site, since up to 40" of topsoil was originally recovered from parts of this area (see R645-301-231.400).

TS-14 Upper Conveyor belt/Access Road: The depth of topsoil recovered will be as follows: 15" of topsoil from 0.03 acres of Doney-Cabba-Podo Complex; 30“ of topsoil from 0.47 acres of Datino-Guben Complex; and 10" of topsoil from 0.16 acres of Winetti-Rock Outcrop Complex. A total volume of 2,171 yd^3 will be recovered from this area. Topsoil will be relocated to the Wild Horse Ridge topsoil stockpile shown on Plate 2-2B and 2-3F. Topsoil recovered form this area will be redistributed at an average depth of 13 to 14 inches. Topsoil redistribution will be performed in conjunction with regrading due to the remoteness of the site and the reclamation procedures for this area.

TS-15 WHR Blind Canyon Seam Portal: The depth of topsoil recovered will be as follows: 15" of topsoil from 0.19 acres of Doney-Cabba-Podo Complex; 30" of topsoil from 0.97 acres of Datino-Guben Complex; 10" of topsoil from 0.34 acres of Winetti-Rock Outcrop Complex; and 10" of topsoil from 0.08 acres of Guben-Pathead Complex. A total volume of 4,860 yd^3 will be salvaged from this area. Topsoil will be relocated to the Wild Horse Ridge topsoil stockpile shown on Plate 2-3F and 2-2B. Topsoil recovered form this area will be redistributed at an average depth of 13 to 14 inches. Topsoil redistribution will be performed in conjunction with regrading due to the remoteness of the site and the reclamation procedures for this area.

TS-16 WHR Tank Seam Lower Portal Access Road: The area consists of an existing recreational road that was in place before mining and will be used post mining. The road will be widened in a in two areas. These areas are shown on Plate 2-3G and have cross-sections through them. The cross-sections are shown in Appendix 5-K. 124 cubic yards of topsoil material will be recovered from this area, and will be relocated to the Wild Horse Ridge Tank Seam Topsoil Stockpile shown on Plate 2-3G. The soils located in this area are described in Appendix 2-G.

TS-17 WHR Tank Seam Upper Access Road and Pad: The soil located in this area is 1.79 acres of Datino Guben Complex. Approximately 6-10" of topsoil will be recovered and may be as deep as 20" along the northeast edge of the pad as described in Appendices 5-K and 2-G. A total volume of 1,317 yd^3 will be salvaged from this area. Topsoil will be relocated to the Wild Horse Ridge Tank Seam Topsoil Stockpile shown on Plate 2-3G and in Appendix 5-K. Topsoil recovered from this area will be redistributed at an average depth of 8". Topsoil redistribution will be performed in conjunction with regarding due to the remoteness of the site and the reclamation procedures for this area.

INTENTIONALY LEFT BLANK FOR MOHRLAND

INTENTIONALY LEFT BLANK FOR MOHRLAND

R645-301-243 Soil Nutrients and Amendments

Following final grading test samples will be taken to represent each of the reclamation areas shown on Plates 2-3. Table 2-9 shows the sample frequency for each reclamation area. Additional samples will be taken in the event that the initial sample indicates unsuitable material. Composite samples will be taken from 0 to 2 ft and from 2 ft to 4 ft at each sample location.

Chemical analysis will be conducted in accordance with the Utah Division of Oil, Gas and Mining Soils Guidelines as outlined in Table 2-7. All necessary fertilization and/or neutralizing compounds will be applied according to the results of the soil sampling and analysis program approved by the division.

2-9 Final Grading Test Sample Density			
MARK	DESCRIPTION	Acreage	SAMPLE FREQUENCY
TS-1	Ball Park Topsoil Pile	1.27	1
TS-2	Lower Haul Road	1.6	1
TS-3	Sed Pond B & Scale Office Pad	2.56	1
TS-4	Sed Pond A	0.75	1
TS-5	Main Pad Area	12.30	5
TS-6	Portal Access Road	2.62	2
TS-7	Blind Canyon Seam Portal Area	1.73	1
TS-8	Upper Storage Pad	0.87	1
TS-9	Shower House Pad	1.83	1
TS-10	Tank Seam Access Road	2.91	2
TS-11	Tank Seam Portal Pad	0.66	1
TS-12	Wild Horse Ridge Access Road	3.26	2
TS-13	Conveyor belt Access/Topsoil Stockpile	1.50	2
TS-14	Upper Conveyor belt Access Road	0.96	1
TS-15	WHR Blind Canyon Seam Portal Area	1.58	2
TS-16	WHR Tank Seam Lower Portal Access Road	0.89	0
TS-17	WHR Tank Seam Upper Access Road and Pad	2.22	2

R645-301-244 Soil Stabilization

244.100 Exposed Surfaces

Exposed regarded surfaces or topsoil will be protected and stabilized to control erosion and minimize air pollution associated with erosion.

244.200 Soil Stabilization

Suitable mulch and other soil stabilizing practices will be applied where such methods are necessary to control erosion and establish an effective vegetative cover.

244.300 Rills and Gullies

Whenever rills or gullies become evident they will be filled, re-graded, rip-rapped and re-seeded tackified, and mulched. This work will commence prior to any significant loss (Rills and Gullies, less than 9 in.).

R645-301-250 Performance Standards

All topsoil, subsoil and topsoil substitutes or supplements will be removed, maintained and redistributed according to the plan given under R645-301-230 and R645-301-240.

All stockpiled topsoil, subsoil and topsoil substitutes or supplements will be located, maintained and redistributed according to plans given under R645-301-230 and R645-301-240.